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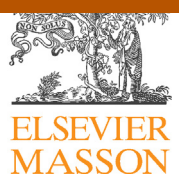

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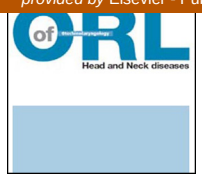

TECHNICAL NOTE

An original submandibular approach technique sparing the cervical branch of the facial nerve

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KEYWORDS
Cervical branch of the facial nerve;
Submandibular gland;
Surgery;
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Transcervical approach

Summary Many articles and anatomy textbooks accurately describe the anatomy and anatomical variations of the marginal mandibular branch of the facial nerve (VII). This is not, however, true for the cervical branch, damage to which results in paralysis of the platysma and, because of its insertions at the lower lip and labial commissure, in disfigurement, especially when smiling. This may be mistaken for paralysis of the marginal mandibular branch of the facial nerve. Precise anatomical description of the cervical branch of the facial nerve allows certain technical safeguards to be determined which, if adhered to, should reduce the risk of injury, especially during surgical excision of the submandibular gland on a transcervical approach.

Introduction

Many articles and anatomy textbooks accurately describe the anatomy and anatomical variations of the marginal mandibular branch of the facial nerve (VII). This is not, however, true for the cervical branch, damage to which results in paralysis of the platysma and, because of its insertions at the lower lip and labial commissure, in disfigurement, especially when smiling, (Fig. 1) [1]. This is often mistaken for paralysis of the marginal mandibular branch of the facial nerve. The present study sought to specify cervical branch anatomy, thereby determining the technical safeguards to be adhered to so as to avoid injury during surgical resection of the submandibular gland using a transcervical approach. It is to be noted that this technique applies only in benign pathology of the submandibular gland (submandibular sialadenitis, submandibular pleomorphic adenoma).

Technique

Anatomy

Approaching the submandibular gland involves dissecting the infero-lateral wall of the submandibular space. From outward to inward, the wall comprises [2]:

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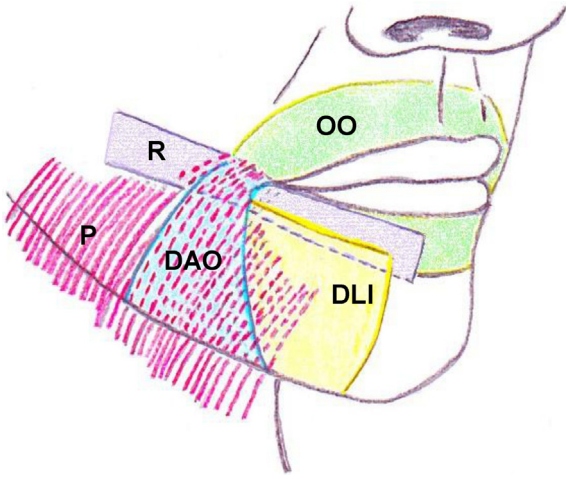

Figure 1 Platysma muscle insertion in the labial commissure and lower lip. DAO: depressor anguli oris; DLI: depressor labii inferioris; OO: orbicularis oris; P: platysma; R: risorius.

- skin;
- subcutaneous tissue;
- the superficial layer of the cervical fascia, which is attached superiorly to the mandible, inferiorly to the hyoid bone and posteriorly to the stylohyoid ligament.

Moving inward, the subcutaneous tissue comprises:

- an external layer rich in fat;
- the superficial musculo-aponeurotic system (SMAS) [3], corresponding to the superficial fascia which contains the platysma;
- an internal fatty layer.

Within the thickness of the fascia lie the submental artery, anterior jugular vein tributaries, facial lymph vessels connecting to the deep periglandular lymph nodes, cervical branch of the facial nerve and the sensory branches of the transverse cervical and great auricular nerves of the superficial cervical plexus, which connect to the second cervical root.

Cervical branch anatomy was precisely described by Ziarah et al. [4], based on 110 formaldehyde-fixed cadaver dissections, performed with the mouth closed and slight cervical rotation contralateral to the dissection, so as to reproduce the position applied in surgical approaches to the submandibular gland. The cervical and marginal mandibular branches of the facial nerve emerge at the anterior-inferior part of the inferior pole of the parotid gland and diverge at a highly variable distance from the parotid, although they are systematically separate before crossing the mandibular angle. The cervical branch is always posterior to the marginal mandibular branch and in 80% of cases comprises a single branch at a mean 0.83 cm (range, 0.2 to 1.4) from the gonion; the precise distance needs to be determined. It then runs along the superficial part of the posterior edge of the submandibular gland, follows an oblique inward trajectory and meets the greater cornu of the hyoid bone, running along its superior edge to the body, where it divides into numerous very fine sub-branches

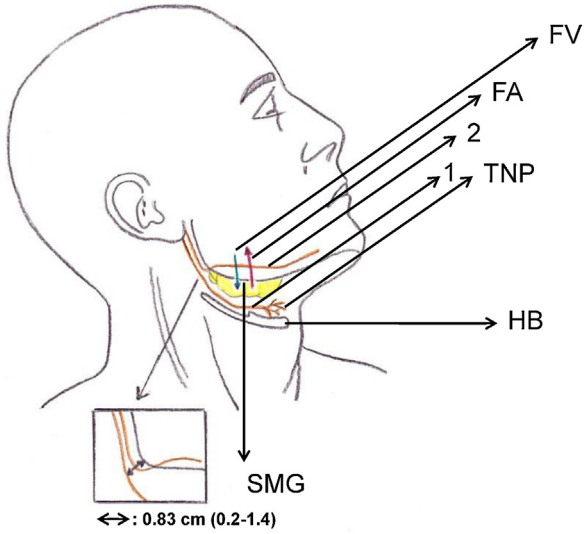

Figure 2 Extra-parotid trajectory of cervical branch of the facial nerve. 1: cervical branch of the facial nerve; 2: mandibular branch of the facial nerve; FV: facial vein; FA: facial artery; SMG: submandibular gland; HB: hyoid bone; TNP: terminal nerve plexus of cervical branch of the facial nerve. Box: mean distance between gonion (mandibular angle) and cervical branch of the facial nerve.

(neural plexus) penetrating the platysma muscle (Fig. 2). If there is no cervico-facial deformity, the greater cornu of the hyoid bone lies on a vertical through the gonion at a mean 30 mm below the mandibular angle, and the body lies on a vertical through the first premolar at a mean 40 mm under the inferior edge of the mandible [4,5]. In 20% of cases, the cervical branch is double, with two branches running together then separating at the postero-superior part of the submandibular gland, both following the trajectory described above. Whatever the form of the cervical branch, it always lies lateral to the superficial cervical aponeurosis and hyoid bone and deep to the platysma muscle; the terminal branches thus always lie on the medial aspect of the platysma (Fig. 3). The cervical branch of the facial nerve

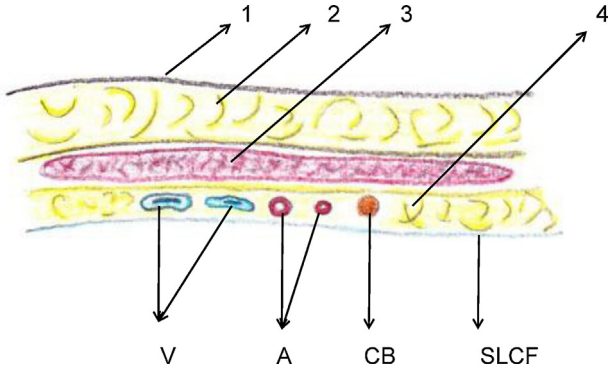

Figure 3 Composition of infero-lateral wall of the submandibular space. 1: skin; 2: external fatty layer; 3: SMAS with the superficial fascia which contains the platysma lies; 4: internal fatty layer; V: anterior jugular vein tributaries; A: submental artery branches; CB: cervical branch of the facial nerve; SLCF: superficial layer of cervical fascia.

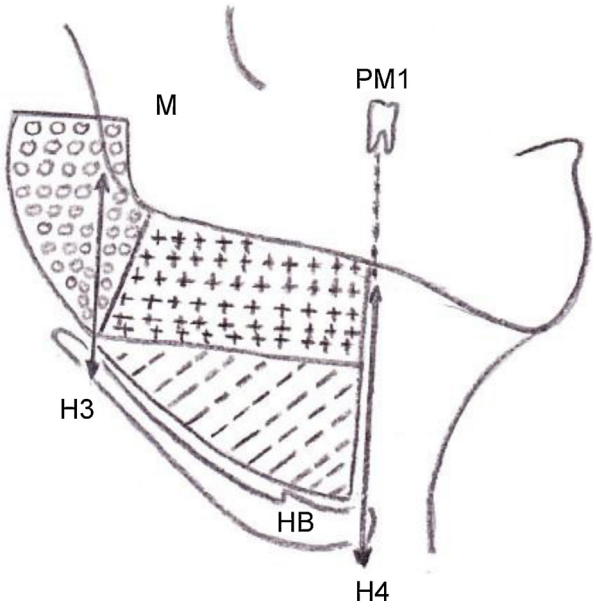

Figure 4 Danger zones for the mandibular and cervical branches of the facial nerve. O: danger zone for both branches; +: danger zone for marginal mandibular branch; /: danger zone for cervical branch. H3: site of incision posteriorly, 3 cm from gonion; H4: site of incision anteriorly, 4 cm from a vertical line passing through the first premolar (PM1). HB: hyoid bone; M: mandible.

anastomoses with two sensory nerves, the great auricular and the transverse cervical, which are both branches of the superficial cervical plexus arising from the second cervical root. The great auricular anastomosis is very high, at the intra-parotid part of the cervical branch of the facial nerve, while the transverse cervical anastomosis lies at the distal extremity of the greater cornu of the hyoid bone. After this second anastomosis, the cervical branch of the facial nerve has a greater diameter, making it easier to identify.

Technical safeguards

Certain technical safeguards to reduce risk of injury to the cervical branch of the facial nerve follow from the above anatomic facts.

Firstly, the position of the neck:

- extension is not mandatory and, if applied, should be moderate;
- slight rotation (< 30°) contralateral to the operated side facilitates submandibular access without altering the position of the cervical branch of the facial nerve with respect to the landmarks detailed above.

Incision should be oblique, forward and downward, starting posteriorly 30 mm below the gonion and ending anteriorly 40 mm below the inferior edge of the mandible, at first premolar level, so as to avoid potential danger zones containing the marginal mandibular and cervical branches of the facial nerve (Fig. 4). In practice, incision should be at the inferior edge of the hyoid bone, which is easily palpable, and, depending on the individual patient, should be made in a skin crease of the neck.

The three planes constituting the infero-lateral wall of the submandibular space are successively incised using a cold-blade scalpel. The platysma muscle is fully sectioned as well as the superficial cervical aponeurosis, following the skin trace. Bipolar rather than monopolar coagulation should be used. The platysma muscle must not be dissected or detached from the superficial cervical aponeurosis. The posterior part of the muscle may be spared, minimizing the risk of cervical branch lesion without in any way hampering the approach to the submandibular space. Once incised and released from the superficial part of the submandibular gland, the superficial cervical aponeurosis and platysma muscle may be retracted as a single piece using Farabeuf retractors at the posterior and anterior extremities of the incision. The posterior retractor pulls the posterior edge of the muscle upward and backward, enabling the cervical branch of the facial nerve also to be shifted upward and back. It is thus unnecessary to locate the trunk and branches of the cervical branch, as with this technique they are never exposed or visible; this avoids any risk of injuring the nerve or its branches, including the fine plexus nerves at the extremity [1,4].

The submandibular gland can then be dissected. Conserving the facial vessels by bipolar coagulation or selective ligature of branches feeding the gland optimizes protection of the cervical branch of the facial nerve. This technique also protects the entire mandibular branch, none of which is visible during dissection. It is in fact one of the three techniques recommended for sparing the mandibular branch, along with [6]:

- specific identification of the branch from its emergence from the parotid gland, dissecting the main branch and any sub-branches — a technique that will not be detailed here;
- ligature of the facial vein, which is pulled upward by the ligature, carrying the mandibular branch upward above the inferior edge of the mandible and thus out of the submandibular space.

After excision of the submandibular gland, the platysma should be painstakingly sutured edge-to-edge, using slow-resorption suture [6]. This is an important step to minimize muscle healing time and the duration of impaired contraction force.

Discussion

As early as 1964, De Sousa [7] demonstrated electromyographically the importance of platysma muscle contraction in lowering the labial commissure and lower lip. The platysma muscle is involved along with the depressor anguli oris (DAO) muscle in the balance between elevating and depressing forces acting on the labial commissure. It also contributes with the depressor labii inferioris (DLI) to lowering the lower lip, both being innervated by the marginal mandibular branch of the facial nerve. Contraction of these three muscles lowers the labial commissure downward and outward and depresses the lower lip. These combined

movements, specific to humans, underlie the expression of sadness, disgust and bitterness and also, in forced smiling, the exposure of the entire upper and lower dental arcades as far as the canines [8]. Facial nerve cervical branch lesions induce asymmetry in these combined movements due to reduced counterbalancing of the labial commissure elevators on the affected side, causing a disfigurement that is often mistaken for a marginal mandibular branch lesion. In most cases, partial sectioning of the cervical branch or sub-branches is performed in the posterior part of the submandibular gland and/or above the extremity of the greater cornu of the hyoid bone [4]. In case of motor deficit following a submandibular approach, it is therefore important to differentiate mandibular from cervical branch involvement. The patient should be asked to contract the platysma muscles, which, in slim patients, allows visualization of asymmetry or lack of platysma fiber contraction just under the skin on the affected side; in patients with too much subcutaneous adipose tissue, palpation will be required, pinching the postero-inferior part of the platysma muscle between thumb and index finger to check for contraction.

Impaired platysma contraction on the operated side is common, due to the sectioning of the muscle [9]: such asymmetry is found in 35—40% of cases [10]; it is transitory, and generally resolves within a month of surgery. It is therefore important to follow patients up, between the 4th and 6th postoperative week.

Conclusion

The anatomy of the cervical branch of the facial nerve is often poorly understood. Injury, however, has considerable esthetic impact, which is sometimes mistakenly attributed to marginal mandibular branch lesion. By respecting a few simple technical points during the approach to the submandibular gland, the nerve can easily be spared.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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